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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Paper No. 13

Application Number: 09/096,113
Filing Date: 6/11/1998
Appellant(s): Hoyler

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Technology Center 2100

Steven H. Noll
For Appellant

EXAMINER'S ANSWER

This is in response to appellant's brief on appeal filed 10/3/2000.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

The appellant's statement in the brief that certain claims do not stand or fall together is agreed with.

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

The following is a listing of the prior art of record relied upon in the rejection of claims under appeal.

5,424,963	Turner et al.	6-1995
5,915,230	Berne et al.	6-1999

Rokhlin et al. "Scalability of the Fast Multipole Method for the Helmholtz Equation." (Pp. 1-8; 3/1997).

Stalzer, M. A. "A Parallel Fast Multipole Method for the Helmholtz Equation." Parallel Processing Letters, vol. 5, No. 2, (1995), pp. 263-274.

Stalzer "Parallelizing the Fast Multipole Method for the Helmholtz Equation." Proceedings of the Seventh SIAM Conference on Parallel Processing for Scientific Computing, Feb. 1995, pp. 325-330.

Coifman et al. "The Fast Multipole Equation for the Wave Equation, A Pedestrian Prescription". IEEE Antennas and Propagation Magazine, vol. 35, No. 3, June 1993, pp. 7-12.

(10) New Prior Art

No new prior art has been applied in this examiner's answer.

(11) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 101

Claims 1-20 rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Specifically, applicant is attempting to claim an algorithm. There is no pre- or post-processing of real data.

Claim Rejections - 35 USC § 112

Claim 12 recites the limitation "stability" in line 1. There is insufficient antecedent basis for this limitation in the claim.

Claims 12 and 13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

- Claim 12: "stability of said body" with respect to what?
- Claim 13: "compatibility" with respect to what? (Examiner appreciates the meaning of electromagnetic compatibility - the question has to do with victim and aggressor nets).

Claim Rejections - 35 USC § 102

Claims 1-3 and 14-15 are rejected under 35 U.S.C. 102(a) as being clearly anticipated by Rokhlin et al. (3/97).

Rokhlin et al. disclose: *Scalability of the Fast Multipole Method for the Helmholtz Equation*; and discloses details of multipole expansions, matrix methods and regions. See sections 1-5.

Claims 1-3 and 14-15 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Stalzer (Parallel Processing Letters - 1995) <u>or</u> Stalzer (1995; from the optical physics laboratory) <u>or</u> Coifman et al..

Stalzer discloses: *A Parallel Fast Multipole Method for the Helmholtz Equation*; and discloses details of multipole expansions, matrix methods and regions. See sections 1-2, 4 and 7.

Stalzer (1995; from the optical physics laboratory) discloses details concerning the fast multipole method and grouping. See particularly: abstract; pg. 326 (FMM Formulation, wherein grouping is discussed).

Coifman et al. disclose: *The Fast Multipole Method for the Wave Equation, A Pedestrian Prescription*; and disclose details of multipole expansions, matrix methods and regions. See entire disclosure and note fig. 2.

__Claim Rejections - 35 USC § 103__

Claims 4-13 and 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over [Stalzer (Parallel Processing Letters - 1995) __or__ Stalzer (1995; from the optical physics laboratory) __or__ Coifman et al.] in view of the taking of official notice.

Stalzer (Parallel Processing Letters - 1995) discloses: *A Parallel Fast Multipole Method for the Helmholtz Equation*; and discloses details of multipole expansions, matrix methods and regions. See sections 1-2, 4 and 7.

Stalzer (1995; from the optical physics laboratory) discloses details concerning the fast multipole method and grouping. See particularly: abstract; pg. 326 (FMM Formulation, wherein grouping is discussed).

Coifman et al. disclose: *The Fast Multipole Method for the Wave Equation, A Pedestrian Prescription*; and disclose details of multipole expansions, matrix methods and regions. See entire disclosure and note fig. 2.

[Stalzer __or__ Stalzer __or__ Coifman et al.] do not disclose the limitations of claims 4-13 and 16-20 which disclose minor details concerning the mechanics of the multipole expansion (such as size of or distance to different regions and details concerning different frequency bands to be investigated); however, official notice is taken that these details would have been obvious to one of ordinary skill in the art at the time of the invention.

Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over [Turner et al. __or__ Berne et al.] in view of the taking of official notice.

Turner et al. (U. S. Patent 5,424,963) disclose a molecular dynamics simulation and method. They teach grouping in terms of molecular dynamics as well as electromagnetics. See particularly: abstract; figs. 1-8 (especially 7; electromagnetic multipole expansion); fig. 15; col. 1, lines 20-66; col. 4, line 63 to col. 6, line 20; col. 7, lines 29-68; section D (cols. 17-23).

Berne et al. disclose: multipole methods and grouping: See: abstract; col. 1, lines 35-4; col. 2, lines 1-32; col. 3; col. 5, lines 16-39; col. 6, lines 7-33; col. 6, line 63 to col. 10 (fast multipole method); col. 13, lines 10-17; col. 14, lines 25-38 (boxes);

Turner et al. or Berne et al. do not disclose the limitations concerning matrix operations as per the multipole expansion (although Berne et al. does reference such methods: col. 26, lines 45-46); however, official notice is taken that these details would have been obvious to one of ordinary skill in the art at the time of the invention. They also do not disclose the limitations of claims 4-13 and 16-20 which disclose minor details concerning the mechanics of the multipole expansion (such as size of or distance to different regions and details concerning frequency bands to be investigated); however, official notice is taken that these details would have been obvious to one of ordinary skill in the art at the time of the invention.

(12) Response to Argument

Applicant's arguments filed 10/3/2000 and have been fully considered but they are not persuasive.

<u>Response to Argument (pp. 6-8, Appeal) - 101 rejections</u>

Applicant has argued that the claims are statutory (pp. 1-3 of paper # 5 and pp. 6-8, appeal brief). This presents an issue that was dispositively addressed in the case *In re Warmerdam*, 33 F. 3d 1354, 31 USPQ2d 1754 (Fed. Cir. 1994).

In that case, the Court addressed an issue where the Applicant claimed an invention where abstract ideas were represented by "bubbles" and were given the structure of a "bubble hierarchy" in the invention's database. The Federal Circuit held that "*the dispositive issue* for assessing compliance with Section 101 in this case is whether the claim is for a process that goes beyond simply *manipulating 'abstract ideas' or 'natural phenomena'* ... As the Supreme Court has made clear, [a]n idea of itself is not patentable, ... *taking several abstract ideas and manipulating them together adds nothing to the basic equation.*" *In re Warmerdam* 31 USPQ2d at 1759 (emphasis added). On that basis, the Court held the "bubble hierarchy" of *Warmerdam* to be nonstatutory.

Consider claim 1. Applicant is claiming a simulation to determine the electromagnetic fields of a body. There is no real world data which is obtained by sensors, and there is no output processing of the simulated data. Applicant is simply <u>attempting to claim a *mathematical algorithm*</u>. Representative argues (page 13, paper # 8) that "...*These numerical values are then used to determine the electromagnetic field of the body, in the second step of each of the independent claims.*" This argument is continued in the brief (pg. 8) where Applicant states that the "...*result of the method is an identification of the electromagnetic field of the body. This is the type of "tangible" thing which the Court of Appeals...*". There is no limitation and teaching in

the specification which defines the body to be a real entity. Applicant also states "...*These expansions result in a set of numerical values which represent real data...*" and refers (pg. 8) to "charges" and "currents". These are *hypothetical* entities. They could represent real data - but, there is no support for the assertion that they must. Applicant also admits (bottom of pg. 8, referring to claim 12) that the body is hypothetical. Claim 12 recites "*...a stability of a body...*". Applicant argues (pg. 8, referring to claim 12) that "*Mathematical stability, however, is a well-known "stand alone" term and merely refers to whether a system represented by mathematical equations...*".

<u>Response to Argument (pp. 8-9, Appeal) - 112(2) rejections</u>

Applicant's arguments concerning the 112 rejection are not persuasive. Examiner cannot determine the meaning of the terms in the <u>*context* of the claims</u>.

- Claim 12: "stability of said body" <u>with respect to *what*</u>?

- Claim 13: "compatibility" <u>with respect to *what*</u>?

Regarding "*stability*"; Applicant argues (pg. 8, referring to claim 12) that "*Mathematical stability, however, is a well-known "stand alone" term and merely refers to whether a system represented by mathematical equations...*". The Examiner does not know what Applicant means by a "*stand alone term*". The Examiner has taken graduate courses in partial differential equations and understands the meaning of *mathematical stability* as well as *stability of a body* (presumably mechanical stability?) and is still not convinced by Applicant's arguments. In fact, Applicant has

essentially argued that "*stability of a method*" and "*stability of a body*" are equivalent (see paper # 9). In any case, Applicant has never claimed "*mathematical stability*". In response to applicant's argument regarding certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., *mathematical stability*) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Regarding "*compatibility*"; as the Examiner stated in paper # 4, in response to Applicant's remarks (page 4 of paper # 5), and in response to pp. 8-9 of the brief, Examiner understands the idea behind the terms. Examiner has never asserted that Compatibility was not well known (see arguments, page 9, paper # 8) - in fact the Examiner is intimately familiar with the concept, having worked on such projects as high frequency, high voltage electrical discharges where electromagnetic compatibility is a critical issue (for example, the need to electromagnetically shield an oscilloscope from the effects of an arc discharge). However, the use in the context of the claims is *ambiguous*. As Applicant has correctly pointed out (page 1, specification), Compatability means:

> "Capacity of an electrical device to function satifactorily in its electromagnetic environment without unacceptably affecting this environment, which is shared by other devices."

The above definition means that a particular device (*victim*) will not be adversely affected by the electromagnetic field of another device or "body" (*aggressor*). The terms *victim* and *aggressor*

are well known terms in the art of electromagnetic interference and compatability. The issue is the following. Claim 13 recites:

> "The method according to Claim 1, wherein the *electromagnetic compatability* of the *body* is determined."

Electromagnetic compatability is a *relationship* between two or more bodies or devices. The criterion is "*without unacceptably affecting this environment*". For example, a radio may be affected by the 60 Hz electromagnetic field of power lines. In order to determine whether the radio would be unacceptably affected by the power lines, the following would have to be determined:

- the strength of the field radiated from the power lines;

- the distance between the power lines and the radio (since all real waves are attenuated with distance);

- the degree of coupling (the electromagnetic fields can be shielded by using filters, etc.);

To carry out this study, one would need to known the field of the "*body*" in question *as well as* details pertaining to the victim circuit. Compatability is a charactization of a certain type of interaction, and *has no meaning for a single object*. *Representative has not specified any "victim" circuit*.

Referring again to Applicant's definition, namely:

> "Capacity of an *electrical device* to *function satifactorily* in its electromagnetic environment without unacceptably affecting this environment, which is shared by other devices."

Applicant has not claimed "*an electrical device*" and the criterion for "*function satifactorly*".

Response to Argument (pp. 9-10, Appeal) - Applicant's comments regarding Prior Art

Applicant has remarked (pages 4-5 of paper # 5) on the following (page 3 of paper # 4):

> "Applicant appears to be claiming details concerning multipole expansions of various near- and far-field regions and superimposing the results - this is well known in the arts - in fact, the matter claimed in the independent claims is taught in undergraduate college electromagnetics courses; the matter taught in claim 2 is taught in graduate electromagnetics courses (equivalent circuit models for electromagnetics problems). Applicant is referred to standard textbooks (see Jackson, *Classical Dynamics*, for example)."

The remarks were intended for Applicant's benefit. In so far as the remarks were presented prior to the actual art rejection, it is clear that the remarks were not intended as part of the art rejection. Examiner has repeatedly but respectfully and strongly, disagreed with Applicant's characterization of paragraph 6 as a gross over-simplification of the claimed subject matter (page 5 of paper # 5, *repeated on pp. 9-10 of the Appeal*). Applicant has not provided any specific rebuttal. In any case, Applicant was again referred to J. D. Jackson or any other standard textbook on electromagnetics. Applicant again questions whether the Jackson citation was part of an art rejection. This is *disingenuous* - the Examiner has stated that the *Jackson* citation was not part of an art rejection. (See paragraph 28, paper # 6). In any case, Applicant is presumed to be of at least one of ordinary skill in the art - one of ordinary skill in the art at the time of the invention would have a graduate degree in electromagnetics and would be familiar with the *Jackson* citation.

Applicant essential argument is that the art *"does not teach or suggest the use of a global multi-pole or a local multi-pole expansion in the context of identifying electromagnetic fields"* (lines 5-6 of page 5 of paper # 5, and throughout the rest of paper # 5). Examiner has carefully reexamined the specification to determine Applicant's definition of *global multi-pole and local multi-pole expansion*. Page 3 (lines 10-19) of the specification recites:

> "In each of the plurality of subregions, *a global multipole expansion is made which represents the effect of the charges and currents for distant points in the form of a multipole expansion, and a local multipole expansion is made, which represents the effect of the charges and currents at points inside this one of the plurality of subregions in the form of a multipole expansion.* The electromagetic field of the body is determined by superposition using the global multipole expansion and the local multipole expansion for the plurality of subregions."

There is no difference between the matter above and the concept of *near-field* and *far-field* approximations, which is a standard technique used, for example, in antenna design. Applicant is *again* referred to J. D. Jackson or any other *standard* textbook on electromagnetics for this *basic* concept.

Response to Argument (pg. 10, Appeal) - Rokhlin et al. rejection

With respect to the Rokhlin et al. rejection, please note sections 2 and 5. Rokhlin et al. introduce *grouping* concepts, *matrix* concepts and the impedance matrix (*Z*) in section 2. Section 5 discloses "*Parallel Fast **Multipole** Method*" and "*near groups*" and "*far groups*". Section 2a discloses summation of all "*far groups*" and section 2b discloses computation of "*local*

interactions". As per Applicant's citation of "*another article by Rokhlin et al. at page 1 of the specification...*"; this is *irrelevant* and merely Applicant's opinion concerning a *different article* by Rokhlin et al.. Examiner would like to refer Applicant to section 5 of the the Rokhlin et al. article used in the art rejection. As per arguments regarding claim 15, Rokhlin et al. disclose the impedance matrix (section 2) and explicit calculations (section 5).

Response to Argument (pp. 10-11, Appeal) - Stalzer et al. and Coifman et al. rejections

Stalzer (1995; from the optical physics laboratory) discloses details concerning the fast multipole method and grouping. *See particularly: abstract; pg. 326 (FMM Formulation, wherein grouping is discussed)*. *Matrix operations* are disclosed in section 2.2.

Stalzer (*A Parallel Fast Multipole Method for the Helmholtz Equation*) discloses details of multipole expansions, matrix methods and regions. Note that abstract. See sections 1-2, 4 and 7. Section 1 discloses the impedance (*Z*) matrix). The Fast Multipole Method is disclosed in section 2. *Page 265 discloses details concerning* ***near- and far-field computations and the*** *concept of* ***grouping, wherein a collection of scatters is broken up into groups.*** Matrix operations are disclosed in section 2.1. Applicant has not provided the Examiner with any credible evidence that Applicant is claiming a novel step beyond that disclosed in the prior art.

Coifman et al. disclose: *The Fast Multipole Method for the Wave Equation, A Pedestrian Prescription*; and disclose details of multipole expansions, matrix methods and regions. See entire disclosure and note fig. 2. Section 3 discloses multipoles and "grouping" concepts. Section 3.2

discloses matrix operations. Col. 2, page 10 of Coifman discloses number of groups and the relation between groups (see Applicant's claims 5-7, for example).

Applicant has asserted that Examiner has not provided sufficient information to Applicant. However, Applicant has not provided a credible response to the explicit citation of fig. 2 in the Coifman reference, for example. It is presumed that Applicant is of at least ordinary skill in the art and would have at least recognized that fig. 2 presents a teaching of "*grouping*" *in the context* of Applicant's claims.

Response to Argument (pp. 11-12, Appeal) - Motivation

Regarding comments concerning motivation to modify (page 11, Appeal); these are minor details which pertain to how the expansion is actually implemented - they are not directed at the core issue, namely *whether "local" and "global" expansions are a novel teaching*. Furthermore this is not a question of motivation. The cited art *all* teaches, for example, matrix methods. Presumably, since the authors of those works were familiar with the basics of matrix operations; the particular operation and sequence of various operations would depend on the desired outcome. In any case, Applicant has not provided a credible case or substantial argument in response to Examiner's taking of the Official notice. The rejection is repeated herein:

> [Stalzer or Stalzer or Coifman et al.] do not disclose the limitations of claims 4-13 and 16-20 which disclose minor details concerning the mechanics of the multipole expansion

(such as _size of_ or _distance to different regions_ and details concerning _different frequency bands_ to be investigated); however, official notice is taken that these details would have been obvious to one of ordinary skill in the art at the time of the invention.

Applicant has not explained why details such as "*size of or distance to different regions* and *details concerning different frequency bands to be investigated*" would not be apparent to a skilled artisan let alone one of ordinary skill in the art at the time of the invention. Applicant has also not explained why they are not minor details. It appears to the Examiner that these features would depend on the particular problem under investigation.

Response to Argument (pg. 13, Appeal) - Turner et al. rejection

As per the Turner et al. rejection, the Representative *trivializes* the Turner invention by characterizing it as (see page 13, paper # 8, repeated, page 13, Appeal),

> *"a method for molecular dynamics simulation, and an apparatus for executing the method. The model which is to be produced is based on information regarding atomic structure. Even though such modeling may represent a highly complex undertaking, this does not constitute a teaching or suggestion or inducement to those of ordinary skill in the art to employ multipole expansion for the purpose of simulating an electromagnetic field of a body. The Examiner cited language at column 17, line 36 in the Turner et al. reference, however, this reference does not make any statement regarding the determination of an electromagnetic field of a body, but instead refers to electrostatic reactions, or interactions."*

Examiner can only speculate as to the intended meaning - what is the difference between an electromagnetic field of a body, electrostatic reactions and electrostatic interactions in terms of

electromagnetic calculations? Applicant's attention is directed to the art of record as well as J. D. Jackson or any other standard textbook on electromagnetics for this basic concept.

In any case, the section does, in fact, provide a teaching of determining the electromagnetic field of a body (*which, of course must be calculated if one wants to determine electrostatic reactions and interactions*), as will be subsequently discussed in depth. Referring merely to the section which Representative has *focused on* (col. 17, line 36), the following comments are in order. Note the title - "*Multipole Expansions*". ***A collection of molecules is, in fact, a "body". It is inherent that the molecules interact with each other via electrostatic forces (Examiner can not imagine any real "body" which is not composed of atoms and/or molecules - and in which said atoms/molecules do not interact with each other via electrostatic forces).*** In the referenced section, Turner is teaching the calculation of multipole expansions of a collection of molecules - in other words, ***multipole expansions of a spatially grouped charge distribution*** since the atoms/molecules inherently possess a number of different charges which are arranged in various locations on the atom/molecules and spatial groupings (two or more atoms/molecules can not occupy the same position [due to the *Heisenberg Uncertainty Principle*]). For example, in a semiconductor, the atoms/molecules are arranged in a periodic (lattice) structure. Molecular structure (i.e, spatial groupings) is inherent in molecular/atomic systems. Even atoms/molecules which appear to lack structure actually do possess structure due to Van de Waals (*dipole-dipole*) forces. This was known to *skilled artisans* in the art at the time of the invention as well as to those of *ordinary skill* in the art at

the time of the invention. In other words, the molecules are the "subregions" which Applicant is attempting to claim and the collection of molecules is the "body" which Applicant is attempting to claim. Calculating the field from a group of charges or atoms is taught in undergraduate physics - this is known as the principle of *superposition*. The advantage of the multipole expansion, which is taught in undergraduate electromagnetism, is illustrated by showing how it is used to estimate *near* and *far radiation fields* from a collection of charges. The concept of multipole expansions is analogous to a mathematical Taylor series expansion and is *itself*, in fact, a *superposition*, wherein each term represents a contribution to the total field from various arrangements of charges. Dipoles are *popularly* known collections of two charges. Those with an undergraduate course in electromagnetics also know that the next term in the multipole expansion is the Quadrapole, followed by the Octopole, and other higher-order terms. Each of the succeeding terms in the multipole expansion has a correspondingly shorter effective radiation field (in other words, the quadrapole field will decay faster that the dipole field, etc.).

In any case, and in point of fact, the Examiner cited *quite a bit more* in the Turner et al. than that as described by Representative on page 13 of paper #8 and page 13 of the Appeal. The rejection is herein recited, *exactly*, as presented by the Examiner to the Representative:

> "Turner et al. (U. S. Patent 5,424,963) disclose a molecular dynamics simulation and method. They teach grouping in terms of molecular dynamics as well as electromagnetics. See particularly:

> abstract; figs. 1-8 (especially 7; electromagnetic multipole expansion); fig. 15; col. 1, lines 20-66; col. 4, line 63 to col. 6, line 20; col. 7, lines 29-68; section D (cols. 17-23)."

Referring to those sections, first, please note fig. 1, and consider it in light of the previous discussion. Fig. 1 discloses *defining groups/substructures* (# 16), *build and initialize group/substructure multipoles* (# 20). Please note fig. 4 which discloses group multipoles. Fig. 7 teaches the *basic idea* involved in *multipole expansions* **(note that ϕ is a *superposition* of $\phi^{(0)} + \phi^{(2)} + \phi^{(4)} + \phi^{(6)} + \ldots$).** Representative's various characterizations regarding Turner et al. are simply without merit.

Response to Argument (pg. 13, Appeal) - Berne et al. rejection

As per comments regarding Berne et al. (Page 13, paper # 8, repeated, page 13, Appeal), Representative states:

> "The Berne et al. reference is a method for simulating biomolecular systems with remote electrostatic reactions. Again, there is no suggestion in this reference to undertake either a global or a local multipole expansion of regions of a body, and to superimpose those expansions, in order to determine the electromagnetic field of the body."

This is disingenuous at best. The issue of "*electrostatic reactions*" is irrelevant. The Representative ignores col. 2, lines 12-32, which the Examiner cited in the art rejection.

> "Greengard and ***Rokhlin*** [11] developed the ***Fast Multipole Method (FMM)*** based on the "tree code" idea, but with ***higher order multipoles in addition to the simple monopole approximation***. ***The FMM method first organizes multipole representations of charge distributions in hierarchically structured boxes, then transforms those multipoles into local field expansions, so that each particle interacts with the local field generated***

> ***from distant particles***. The multipoles are generated by direct calculation in the lowest level and successive shifting from lower levels to upper levels. ***This invention describes a top-down recursive method to generate the multipoles in the hierarchical box tree, in which the multipoles are calculated recursively from the top of the tree instead of from the bottom as in Greengard's FMM method***. At each level of the tree, the method first looks for charged particles in every box. If there is no charged particles in a particular box, then the multipoles and local field expansions for that box and all its subdivided boxes are assigned automatically to be zero without any further calculations. This is more efficient for nonuniform or noncubic systems, such as proteins."

This paragraph, *by itself*, constitutes 102 art against the claim 1. Note that this is the same *Rokhlin*, as cited in other art rejections asserted in the present application. Also note lines 24-46 of col. 1; lines 16-39 of col. 5; lines 7-33 of col. 6 which discloses the same ideas. Note the caption to fig. 8 (col. 4) which discloses using various numbers of levels (refer to Applicant's claim 19). The *Fast Multipole Method* is disclosed in col. 6, line 63 to col. 10, line 58. Particularly note col. 7, lines 19-35; col. 8, lines 1-67; and col. 9, lines 13 to col. 10, line 58 which explicitly disclose the *grouping* and *superposition* features (in the context of multipole expansions) which Applicant is attempting to claim. Also note col. 13, line 10 to col. 14, line 65 and col. 19, lines 1-28 which discloses *near*, *medium* and *far* zones. Of course this is a well known and basic concept as it relates to multipoles (for a well known example, consider *near* and *far field* approximations which are *always* considered when designing antennas).

<u>Response to Argument - Summary</u>

In summary, the Examiner would like to refer to Representative's final argument (page 13, last paragraph) which has been argued repeatedly throughout prosecution of the present application, and is recited herein:

> *"In general, Appellant respectfully submits that the <u>Examiner has assumed that since the superposition is known, and since mathematical techniques for multipole expansion are known, it would somehow be obvious to employ multipole expansions in the context of electromagnetic field simulation</u>. The references of record are the best evidence against this conclusion, because despite extensive literature on the subject of mulripole exapnsions, there is no statement in any of the references describing how a global multipole expansion and a local multipole expansion can be employed to simulate an electromagnetic field, as set forth in the claims of the present invention."*

Multipole expansions were developed for electromagnetic problems. Thus, it is *inherent* that multipole expansions are used in electromagnetics. In any case, the Representative, however, has not discussed the equations (see last paragraph, page 4, paper # 8). Examination of those equations would reveal that Applicant is merely adding contributions (*superposition*) to the electromagnetic field from various spatially separated sources. *<u>This is the basic principle of electromagnetism</u>*. The Examiner attempted to refer the Representative to elementary texts, disclosing concepts well by those of ordinary skill in the art at the time of the invention, which are presumed to be known by Applicant since it is presumed that Applicant is of at least of ordinary skill. A multipole calculation is just a well known technique to add the contributions to tease out near and far-field contributions to the field from a given collection of charges. *Designating* various contributions as "*global*" or "*local*" is neither *novel* nor *non-obvious*.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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November 5, 2000

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